REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED

REV																				
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REV STATUS OF SHEETS				REV																
				SHEET			1	2	3	4	5	6	7	8	9	10	11			

PMIC N/A

STANDARD MICROCIRCUIT DRAWING

THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE

AMSC N/A

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DRAWING APPROVAL DATE
96-06-28

REVISION LEVEL

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

MICROCIRCUIT, HYBRID, LINEAR, 12 VOLT, DUAL CHANNEL, DC/DC CONVERTER

SIZE	CAGE CODE	
A	**67268**	**5962-95703**

SHEET 1 OF 11

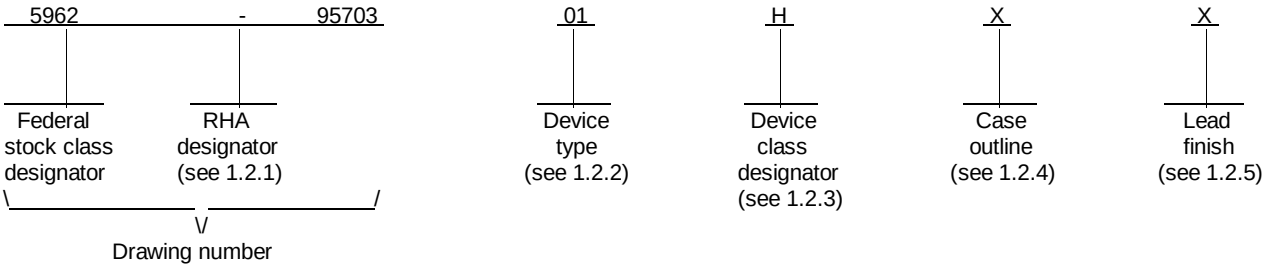
DESC FORM 193
JUL 94

5962-E145-96

1. SCOPE

1.1 Scope. This drawing forms a part of a one part - one part number documentation system (see 6.6 herein). This drawing describes device requirements for hybrid microcircuits to be processed in accordance with MIL-PRF-38534. Two product assurance classes, military high reliability (device class H) and space application (device class K) and a choice of case outlines and lead finishes are available and are reflected in the Part or Identifying Number (PIN). When available, a choice of radiation hardness assurance levels are reflected in the PIN.

1.2 PIN. The PIN shall be as shown in the following example:



1.2.1 Radiation hardness assurance (RHA) designator. Device classes H and K RHA marked devices shall meet the MIL-PRF-38534 specified RHA levels and shall be marked with the appropriate RHA designator. A dash (-) indicates a non-RHA device.

1.2.2 Device type(s). The device type(s) shall identify the circuit function as follows:

Device type	Generic number	Circuit function
01	MCH2812D	DC-DC converter, 1.5 W, ±12 V output

1.2.3 Device class designator. This device class designator shall be a single letter identifying the product assurance level as follows:

Device class	Device requirements documentation
H or K	Certification and qualification to MIL-PRF-38534

1.2.4 Case outline(s). The case outline(s) shall be as designated in MIL-STD-1835 and as follows:

Outline letter	Descriptive designator	Terminals	Package style
X	See figure 1	7	Dual-in-line

1.2.5 Lead finish. The lead finish shall be as specified in MIL-PRF-38534 for classes H and K. Finish letter "X" shall not be marked on the microcircuit or its packaging. The "X" designation is for use in specifications when lead finishes A, B, and C are considered acceptable and interchangeable without preference.

1.3 Absolute maximum ratings. 1/

Input voltage range	-0.5 V dc to +50 V dc
Power dissipation (P_D)	4.2 W
Output power	1.56 W
Lead temperature soldering, (10 seconds)	+300° C
Storage temperature range	-65° C to +150° C

1.4 Recommended operating conditions.

Input voltage range	+12 V dc to +50 V dc
Case operating temperature range (T_C)	-55° C to +125° C

1/ Stresses above the absolute maximum ratings may cause permanent damage to the device, except that input voltage transients up to 80 V for no more than 100 milliseconds are allowed.

2. APPLICABLE DOCUMENTS

2.1 Government specification, standards, and handbook. Unless otherwise specified, the following specification, standards, and handbook of the issue listed in that issue of the Department of Defense Index of Specifications and Standards specified in the solicitation, form a part of this drawing to the extent specified herein.

SPECIFICATION

PERFORMANCE

MIL-PRF-38534 - Hybrid Microcircuits, General Specification for.

STANDARDS

MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.
MIL-STD-973 - Configuration Management.
MIL-STD-1835 - Microcircuit Case Outlines.

HANDBOOK

MILITARY

MIL-HDBK-780 - Standardized Military Drawings.

(Copies of the specification, standards, and handbook required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing shall take precedence.

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with MIL-PRF-38534 and as specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38534 and herein.

3.2.1 Case outline(s). The case outline(s) shall be in accordance with 1.2.4 herein and figure 1.

3.2.2 Terminal connections. The terminal connections shall be as specified on figure 2.

3.3 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in table I and shall apply over the full specified operating temperature range.

3.4 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table II. The electrical tests for each subgroup are described in table I.

3.5 Marking. Marking shall be in accordance with MIL-PRF-38534. The part shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's PIN may also be marked as listed in QML-38534.

3.6 Manufacturer eligibility. In addition to the general requirements of MIL-PRF-38534, the manufacturer of the part described herein shall maintain the electrical test data (variables format) from the initial quality conformance inspection group A lot sample, produced on the certified line, for each device type listed herein. The data should also include a summary of all parameters manually tested, and for those which, if any, are guaranteed. This data shall be maintained under document revision level control by the manufacturer and be made available to the preparing activity (DESC-EC) upon request.

3.7 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to supply to this drawing. The certificate of compliance submitted to DESC-EC shall affirm that the manufacturer's product meets the requirements of MIL-PRF-38534 and the requirements herein.

3.8 Certificate of conformance. A certificate of conformance as required in MIL-PRF-38534 shall be provided with each lot of microcircuits delivered to this drawing.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55°C \le T_C \le +125°C$ V_{IN} = 28 V dc ±0.5 V unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Output voltage	$\pm V_{OUT}$	$\pm I_{OUT}$ = ±31.3 mA	1	01	11.88	12.12	V
			2,3		11.52	12.48	
Output current 1/	I_{OUT}	V_{IN} = 12, 28, and 50 V dc	1,2,3	01	0.0	100	mA
Output ripple voltage ($\pm V_{OUT}$) 2/	V_{RIP}	$\pm I_{OUT}$ = ±62.5 mA, B.W. = 10 kHz to 2 MHz	1	01		150	mVp-p
			2,3			250	
Line regulation ($\pm V_{OUT}$)	VR_{LINE}	$\pm I_{OUT}$ = ±62.5 mA, V_{IN} = 12 to 50 V dc	1,2,3	01		400	mV
Load regulation ($\pm V_{OUT}$)	VR_{LOAD}	$\pm I_{OUT}$ = ±6.3 to ±62.5 mA	1,2,3	01		1200	mV
Input current	I_{IN}	I_{OUT} = 0, inhibit pin (pin 7) = 0	1,2,3	01		3.5	mA
		I_{OUT} = 0, inhibit pin (pin 7) = open				14	

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55°C \le T_C \le +125°C$ V_{IN} = 28 V dc ±0.5 V unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Input ripple current	I_{RIP}	$\pm I_{OUT}$ = ±62.5 mA, B.W. = 10 kHz to 10 MHz, L_{IN} = 2 µH	1	01		200	mAp-p
			2,3			250	
Efficiency	Eff	$\pm I_{OUT}$ = ±62.5 mA	1	01	73		%
			2,3		70		
Isolation	ISO	500 V dc, input to output or any pin to case, except pin 5. T_C = +25°C	1	01	100		MΩ
Power dissipation, load fault	P_D	Short circuit	1	01		3.8	W
			2,3			4.2	
Switching frequency	F_S	$\pm I_{OUT}$ = ±62.5 mA	4	01	300	450	kHz
			5,6		270	470	
Output response to step transient load 3/ changes ($\pm V_{OUT}$)	VO_{TLOAD}	50 percent load to/from 100 percent load; balanced loads on each output	4	01	-600	+600	mV peak
			5,6		-700	+700	
Recovery time, step transient load 3/ 4/ changes ($\pm V_{OUT}$)	TT_{LOAD}	50 percent load to/from 100 percent load; balanced loads on each output	4	01		700	µs
			5,6			800	

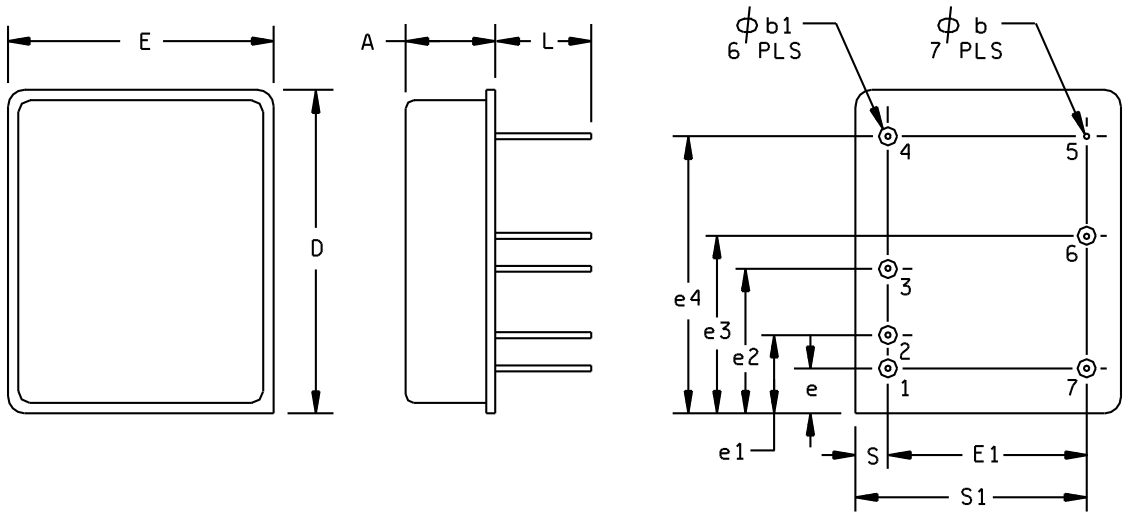
See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55°C \le T_C \le +125°C$ V_{IN} = 28 V dc ±0.5 V unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Output response to transient step line changes 5/ 6/ ($\pm V_{OUT}$)	VO_{TLINE}	Input step from 12 V dc to 50 V dc, $\pm I_{OUT}$ = ±62.5 mA	4,5,6	01	-600	+600	mV pk
		Input step from 50 V dc to 12 V dc, $\pm I_{OUT}$ = ±62.5 mA			-600	+600	
Recovery time, transient step line changes 4/ 5/ 6/ ($\pm V_{OUT}$)	TT_{LINE}	Input step from 12 V dc to 50 V dc, $\pm I_{OUT}$ = ±62.5 mA	4,5,6	01		4	ms
		Input step from50 V dc to 12 V dc, $\pm I_{OUT}$ = ±62.5 mA				4	
Turn-on delay 4/ 7/	Ton_D	V_{IN} = 0 to 28 V dc, $\pm I_{OUT}$ = ±62.5 mA	4,5,6	01		45	ms
Turn-on overshoot 5/	$Vton_{OS}$	V_{IN} = 0 to 28 V dc, $\pm I_{OUT}$ = ±62.5 mA	4,5,6	01		350	mV pk
Load fault recovery 4/ 5/	Tr_{LF}	$\pm I_{OUT}$ = from S. C. to ±62.5 mA	4,5,6	01		20	ms
Capacitive load, 5/ 8/ (both outputs)	C_L	No effect on dc performance T_C = +25°C	4	01		100	µF

1/ The total output power available is 80 percent from either output up to 1.2 watts, providing the opposite output is simultaneously carrying 20 percent of the total output power. Each output must carry a minimum of 20 percent of the total output power in order to maintain regulation on the negative output.
2/ Bandwidth guaranteed by design. Tested for 10 kHz to 2 MHz.
3/ Load step transition time is 10 microseconds maximum.
4/ Recovery time is measured from the initiation of the transient to where V_{OUT} has returned to within ±1 percent of V_{OUT} final value.
5/ Parameter shall be tested as part of design characterization and after design or process changes. Therefore shall be guaranteed to the limits specified in table I.
6/ Input step transition time greater than 10 microseconds.
7/ Turn-on delay time measurement is for either a step application of power at the input or the removal of a ground signal from the inhibit pin (pin 7) while power is applied to the input.
8/ Capacitive load may be any value from 0 to the maximum limit without compromising dc performance.

Case outline X.



Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A		6.86		0.270
øb	0.41	0.51	0.016	0.020
øb1	1.37	1.47	0.054	0.058
D		24.77		0.975
e	3.30	3.56	0.130	0.140
e1	5.84	6.10	0.230	0.240
e2	10.92	11.18	0.430	0.440
e3	13.46	13.72	0.530	0.540
e4	21.08	21.34	0.830	0.840
E		20.32		0.800
E1	15.11	15.37	0.595	0.605
L		7.40		0.290
S	2.34	2.60	0.092	0.102
S1	17.58	17.83	0.692	0.702

NOTES:
1. The U.S. government preferred system of measurement is the metric SI. This item was designed using inch-pound units of measurement. In case of problems involving conflicts between the metric and inch-pound units, the inch-pound units shall rule.
2. Pin numbers are for reference only.
3. Device weight - 12 grams maximum.

FIGURE 1. Case outline(s).

Device type	01
Case outline	X
Terminal number	Terminal symbol
1	Input
2	Input return
3	Positive output
4	Output return
5	Case ground
6	Negative output
7	Inhibit

FIGURE 2. Terminal connections.

TABLE II. Electrical test requirements.

MIL-PRF-38534 test requirements	Subgroups (in accordance with MIL-PRF-38534, group A test table)
Interim electrical parameters	
Final electrical test parameters	1*,2,3,4,5,6
Group A test requirements	1,2,3,4,5,6
Group C end-point electrical parameters	1
MIL-STD-883, group E end-point electrical parameters for RHA devices	Subgroups ** (in accordance with method 5005, group A test table)

* PDA applies to subgroup 1.
** When applicable to this standard microcircuit drawing, the subgroups shall be defined.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-PRF-38534.

4.2 Screening. Screening shall be in accordance with MIL-PRF-38534. The following additional criteria shall apply:

a. Burn-in test, method 1015 of MIL-STD-883.

(1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DESC-EC or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1015 of MIL-STD-883.

(2) T_C as specified in accordance with table I of method 1015 of MIL-STD-883.

b. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

4.3 Quality conformance inspection. Quality conformance inspection shall be in accordance with MIL-PRF-38534 and as specified herein.

4.3.1 Group A inspection. Group A inspection shall be in accordance with MIL-PRF-38534 and as follows:

a. Tests shall be as specified in table II herein.

b. Subgroups 7, 8, 9, 10, and 11 shall be omitted.

4.3.2 Group B inspection. Group B inspection shall be in accordance with MIL-PRF-38534.

4.3.3 Group C inspection. Group C inspection shall be in accordance with MIL-PRF-38534 and as follows:

a. End-point electrical parameters shall be as specified in table II herein.

b. Steady-state life test, method 1005 of MIL-STD-883.

(1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DESC-EC or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1005 of MIL-STD-883.

(2) T_C as specified in accordance with table I of method 1005 of MIL-STD-883.

(3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

4.3.4 Group D inspection. Group D inspection shall be in accordance with MIL-PRF-38534.

4.3.5 Group E inspection. Group E inspection is required only for parts intended to be marked as radiation hardness assured (see 3.5 herein). RHA levels for device classes H and K shall be M, D, R, and H. RHA quality conformance inspection sample tests shall be performed at the RHA level specified in the acquisition document.

a. RHA tests for device classes H and K for levels M, D, R, and H shall be performed through each level to determine at what levels the devices meet the RHA requirements. These RHA tests shall be performed for initial qualification and after design or process changes which may affect the RHA performance of the device.

b. End-point electrical parameters shall be as specified in table II herein.

c. Prior to total dose irradiation, each selected sample shall be assembled in its qualified package. It shall pass the specified group A electrical parameters in table I for subgroups specified in table II herein.

d. For device classes H and K, the devices shall be subjected to radiation hardness assured tests as specified in MIL-PRF-38534 for RHA level being tested, and meet the postirradiation end-point electrical parameter limits as defined in table I at T_A = +25°C ±5 percent, after exposure.

e. Prior to and during total dose irradiation testing, the devices shall be biased to establish a worst case condition as specified in the radiation exposure circuit.

f. For device classes H and K, subgroups 1 and 2 in table V, method 5005 of MIL-STD-883 shall be tested as appropriate for device construction.

g. When specified in the purchase order or contract, a copy of the RHA delta limits shall be supplied.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-PRF-38534.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use for Government microcircuit applications (original equipment), design applications, and logistics purposes.

6.2 Replaceability. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.

6.3 Configuration control of SMD's. All proposed changes to existing SMD's will be coordinated with the users of record for the individual documents. This coordination will be accomplished in accordance with MIL-STD-973 using DD Form 1692, Engineering Change Proposal.

6.4 Record of users. Military and industrial users shall inform Defense Electronics Supply Center when a system application requires configuration control and the applicable SMD. DESC will maintain a record of users and this list will be used for coordination and distribution of changes to the drawings. Users of drawings covering microelectronic devices (FSC 5962) should contact DESC-EC, telephone (513) 296-6047.

6.5 Comments. Comments on this drawing should be directed to DESC-EC, Dayton, Ohio 45444, or telephone (513) 296-5373.

6.6 One part - one part number system. The one part - one part number system described below has been developed to allow for transitions between identical generic devices covered by the three major microcircuit requirements documents (MIL-PRF-38534, MIL-PRF-38535, and 1.2.1 of MIL-STD-883) without the necessity for the generation of unique PIN's. The three military requirements documents represent different class levels, and previously when a device manufacturer upgraded military product from one class level to another, the benefits of the upgraded product were unavailable to the Original Equipment Manufacturer (OEM), that was contractually locked into the original unique PIN. By establishing a one part number system covering all three documents, the OEM can acquire to the highest class level available for a given generic device to meet system needs without modifying the original contract parts selection criteria.

Military documentation format	Example PIN under new system	Manufacturing source listing	Document listing
New MIL-PRF-38534 Standard Microcircuit Drawings	5962-XXXXXZZ(H or K)YY	QML-38534	MIL-BUL-103
New MIL-PRF-38535 Standard Microcircuit Drawings	5962-XXXXXZZ(Q or V)YY	QML-38535	MIL-BUL-103
New 1.2.1 of MIL-STD-883 Standard Microcircuit Drawings	5962-XXXXXZZ(M)YY	MIL-BUL-103	MIL-BUL-103

6.7 Sources of supply for device classes H and K. Sources of supply for device classes H and K are listed in QML-38534. The vendors listed in QML-38534 have submitted a certificate of compliance (see 3.7 herein) to DESC-EC and have agreed to this drawing.

STANDARD MICROCIRCUIT DRAWING SOURCE APPROVAL BULLETIN

DATE: 96-06-289

Approved sources of supply for SMD 5962-95703 are listed below for immediate acquisition only and shall be added to QML-38534 during the next revision. QML-38534 will be revised to include the addition or deletion of sources. The vendors listed below have agreed to this drawing and a certificate of compliance has been submitted to and accepted by DESC-EC. This bulletin is superseded by the next dated revision of QML-38534.

Standard microcircuit drawing PIN	Vendor CAGE number	Vendor similar PIN 1/
5962-9570301HXA	50821	MCH2812D/883
5962-9070301HXC	50821	MCH2812D/883

1/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.

Vendor CAGE number	Vendor name and address
50821	Interpoint Corporation 10301 Willows Road Redmond, WA 98073-9705